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Syllable Structure in the Mental Lexicon: Evidence from Hindi

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Some prominent models of speech production assume that words are stored as linear sequences of phonemes which are syllabified at the moment of production (Levelt *et al.*, 1999). The rationale for this is that syllables are completely predictable from the sequence of phonemes. It is also assumed that when a language often resyllabifies words in connected speech (as in English), storing syllable structure is redundant and wasteful (Levelt *el al., 1999*).

However, recent evidence from Italian aphasic patients strongly suggest that syllable structure is lexically represented (Romani *et al*., 2011). We present a cross-linguistic comparison study in Hindi to see if stored syllable structure is a universal linguistic phenomenon or language-specific. Storing syllable structure has a number of advantages, including enabling mental representations to be more stable and resistant to damage. Resyllabification only affects word (or morpheme) boundaries which are well-defined and limited parts of the full mental representation and, in some languages, resyllabification rarely occurs.

We tested five Hindi patients, divided into patients with articulatory planning difficulties (articulatory patients) and patients with deficits in retrieving phonological representations (phonological patients). Our results from showed that syllable structure was preserved in three ways:

1. *Deletions were more probable in syllabically weak positions*: Consonants were more vulnerable to deletion than vowels (**95%** for phonological and **89%** for articulatory patients). Most deletions involved onset-satellites and codas rather than onset-cores (phonological: 67%; articulatory 62%). These errors changed the internal structure of syllables, but did not restructure the syllables of words.
2. *Substitutions preserved the original syllabic structure of the word:* Hetero-syllabic clusters were turned into hetero-syllabic clusters or geminates and tautosyllabic clusters were turned into tautosyllabic clusters (e.g. tt>rt is more likely than tt>tr). This effect was seen in both phonological (**97%**) and articulatory patients (**94%**).
3. *Phonemes were not coded for syllable position:* Even though syllable structure was preserved, individual phonemes often moved from one syllable position to another. Onset phonemes moved to coda position (phonological: **75%; articulatory**: **66%**) and onset satellite positions (phonological: **25%;** articulatory: **33%**). Stored representations consist of abstract segments organised into syllables rather than position-specific segments.

Observing consistent results across patient types was significant because if syllable structure was computed only after phoneme retrieval, it would constrain the errors of articulatory, but not phonological patients. These results show that syllables are lexically represented in at least a class of languages, and, perhaps, universally. Our own computational results, however, also make it possible that languages differ according to whether resyllabification is uncommon (as in Hindi and Italian) or more common (as in English). At the same time, the computational results showed that computing syllables on-line was never as computationally efficient as storing them.

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